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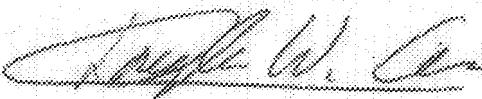
March 21, 1997

Mr. William F. Caton
Secretary
Federal Communications Commission
Room 222
1919 M Street N.W.
Washington, D.C. 20554

Dear Mr. Caton:

Enclosed for filing are the original and 16 copies of Christensen Associates' comments regarding the Notice of Inquiry in CC Docket 96-263, "Usage of the Public Switched Network by Information Service and Internet Access Providers." We have also included a 3.5 inch diskette with a WordPerfect 5.1 version of our comments.

Sincerely,



Douglas W. Caves,
Senior Vice President

Enclosure

Rec'd at Office of General Counsel
03-16-97

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**Comments on FCC Notice of Inquiry on Implications of Information Service
and Internet Usage**

by Douglas W. Caves
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Christensen Associates
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1. Introduction

In its December 23, 1996 Notice of Inquiry on implications of information service and Internet usage, the Federal Communications Commission (FCC) asks "whether, after we complete reform of access charges as contemplated in this inquiry, we should consider any additional actions relating to interstate information services and the Internet."¹ In particular, the Commission invites "parties to identify means of addressing the congestion concerns raised by incumbent LECs..."² The Commission goes on to note examples of how to relieve congestion, including hardware to route data traffic around incumbent switches or by installing new high-bandwidth access technologies.³

We believe it is imperative for the Commission to consider additional actions; the future of the Internet as a major driver of the information sector depends upon

¹ "In the Matter of Usage of the Public Switched Network by Information Service and Internet Access Providers," Notice of Inquiry, CC Docket 96-263, December 23, 1996 (hereafter referred to as " NOI"), at para 312.

² NOI, at para 313.

³ Id.

reforms that will allow it to function efficiently. However, while additional capacity and new access technologies may be part of the solution, a fundamental cause of the congestion problems related to Internet access is the improper pricing of such access. The Commission notes in the related access reform proceeding that enhanced service providers (ESPs) typically pay local exchange carriers a flat monthly rate for their connections regardless of the congestion costs of the usage they generate.⁴ This practice strips away incentives for ESPs to manage usage to minimize access congestion and does not provide incentives for LECs to invest to relieve congestion. Therefore, a key component of any solution to Internet access congestion is pricing reform.⁵

The Commission also invites comment on whether there should be distinction "between different categories of information or enhanced services."⁶ The Commission notes that "arguments about network congestion caused by long hold-time calls would not seem to apply to information services such as telemessaging or credit card validation."⁷

⁴ "In the Matter of Access Charge Reform," Notice of Proposed Rulemaking, CC Docket 93-282, December 23, 1996, at para 285.

⁵ While pricing reform of ESP's interstate access will help alleviate congestion, not all Internet usage is accommodated through interstate access. For example, there are local Internet access providers who only use LEC intrastate facilities. Thus, although outside the scope of the current proceeding, a total solution to the congestion problem would include pricing reforms of other portions of the LEC networks and, more broadly, the networks of Internet providers.

⁶ NOI, at para 316.

⁷ Id.

The LEC facilities are typically designed for circuit-switched voice calls, while the Internet is a packet-switched data network. Any user connected to the Internet through LEC facilities must therefore set up an end-to-end circuit in the LEC facility, before realizing the efficiencies of the packet-switched technologies on the Internet. Thus, at any given instant, such users use the same amount of LEC bandwidth, regardless of how they use the Internet. The only distinction between the different information services would be the length of use time of the LEC facility, and this is completely captured by using an appropriate billing determinant (such as a time-sensitive per second rate for any service). All other distinctions between different categories of information services are lost from the LEC perspective, even though distinctions may exist on the packet-switched Internet.⁸

We base our comments on twenty years of experience in advocating, designing, and evaluating, efficient pricing schemes for the electric power industry. First, we note that, from an economic standpoint, while there are differences between the Internet and the electric power network, there are substantial parallels. Both provide service over geographically dispersed regions. Both utilize networks over which traffic flows according to certain physical and engineering rules. Both experience capacity constraints caused either by surges in demand or equipment failures. Both provide service in real time, but serve customers who can readily adjust their demands. In both

⁸ However, once the LEC converts to a packet-switched network, it may be necessary to distinguish between the various information services (e.g., an email that is sent using "best effort" routing would tie up less resources than a real-time video conference).

industries, service has several dimensions, and each dimension carries a different value for different customers. Finally in both industries, standard pricing practices have been woefully inadequate to engender efficient economic behavior on the part of customers who utilize the existing resource and suppliers who invest in tomorrow's system.

In the electric power industry, the move toward efficient pricing was initiated nearly two decades ago in the presence of looming capacity shortages. Recent capacity constraints on the Internet will no doubt spur similar moves toward pricing reform. There are however, some lessons from the electric power industry which merit consideration at this juncture in the development of the Internet.

2. The Absence of Efficient Prices Causes Severe Miscallocations

Traditional electric utility prices are, like today's Internet access pricing, devoid of any relationship to the marginal cost of providing the service. In network applications, where service value to the customer is highly time dependent and where storage opportunities are very costly, a key component of the marginal cost is "customer outage costs." These are the costs that some customers bear when they cannot get service when they want it because other customers have used all the available capacity. We have found in electricity applications that outage costs, which are not measured by any of the supply-side accounts commonly used by regulatory bodies, account for an

overwhelming proportion of marginal costs during times when the system is constrained. If current prices do not reflect these costs then users have no incentive to take these costs into account when they decide to use the network—and in fact, they have no way of ever knowing what such costs are.

Failure to recognize such costs in traditional pricing has led to the tangible experiences of brownouts and blackouts when constraints became binding; but it has also led to higher rate levels as utilities built costly capacity for use only when blackouts threatened. It has been demonstrated that the costs of that capacity exceed the value that many customers placed on marginal usage at the times that capacity was ultimately used.

3. Technical Barriers to Efficient Pricing Have Fallen Rapidly

Cost-benefit studies of efficient electricity pricing in the early 1980's were hampered by an inability to accurately predict the rapid decline in the costs of the metering and communication functions that are essential to efficient pricing. But as these costs have fallen the electric industry has moved from a few tentative, experimental marginal cost based prices in the 1970's, to wide-scale implementations in the 1990's.

The Internet provides a natural application for efficient pricing since the metering and communication functions that are required for some advanced forms of pricing are

already an inherent part of the service provided. Moreover, computers could be programmed to automatically perform such non-peak activities as file transfer and nonpriority e-mail at non-peak times, depending on the pricing signals received. Therefore, it appears that more efficient pricing mechanisms will provide large benefits in Internet applications.

4. Customers Will Adapt to and Respond to Efficient Prices

For the past two decades, the electric utility industry has served as a laboratory for developing techniques for measuring customer response to marginal cost based pricing of network services. There have been dozens of carefully structured market tests which produced large data sets of customer usage of electricity in response to flexible prices. In the electric utility industry, marginal cost based prices generally take the form of time-varying prices. This form may or may not be best for the pricing of Internet services or Internet access (see Sec. 5 below). The key concept is that prices reflect the marginal cost that the user imposes on the system, including congestion costs. Traditional flat monthly access fees are inadequate for this purpose.

We are not suggesting that customer price response for using electricity would necessarily reveal much about customer price response for use of the Internet. Nonetheless, there are two key lessons that these electricity pricing experiments hold for Internet pricing. First, customers do respond to price signals. For example, as

current prices (hourly, in the electricity case) reach levels seven to ten times average levels, some customers cut back usage by thirty to forty percent. These cutbacks relieve constraints and eliminate the need to build more capacity. Second, paying these high prices does not adversely affect the customer. This is because the customers on flexible prices face lower than average prices during almost all hours. In fact, flexible customers who shift usage out of the high cost periods and into the lower prices hours achieve substantial savings while contributing to an overall improvement in network utilization.

Finally, it should be noted that utility industry experiments have led to a substantial body of knowledge on how to design flexible pricing experiments and how to analyze customer responses and benefits. This knowledge could readily be applied to Internet usage analysis.

5. Expect Some Adherence to Traditional Price Structures

Despite the efficiency and appeal of flexible prices, not all customers will tolerate such pricing. For such customers, a properly structured market may make products available at guaranteed prices, provided that customers are willing to pay the costs that they impose on the network by insisting on guaranteed prices. The guaranteed price is a lot like the traditional utility price—the customers can use electricity at any time regardless of current marginal costs. But because of the risk it imposes on suppliers,

the guaranteed price offering will be higher than average flexible prices. And it will be adopted only by those customers who are willing to pay the extra price. As the electric utility becomes more market oriented over the next few years, we expect to see the guaranteed price surviving along with the more flexible prices that reflect current marginal cost. Likewise, it is possible that a flat monthly access fee could survive for Internet services, but only if it reflected the underlying costs of the users who select such a fee structure.

6. Expect a Wide Array of Product Price Structures

With the advent of pricing flexibility utilities have discovered that sale of electric energy actually carried with it a number of so-called "ancillary services," largely related to maintaining service quality. This is leading to the exploration of methods to break apart and separately price packages of services so that individual customers can select packages that best meet their requirements. We expect this type of " unbundling" to apply to Internet services as the Internet services industry matures.

7. The Best Time to Implement Efficient Prices is When the Industry is Young

Any pricing structure carries benefits for certain groups which strongly resist changes that erode those benefits. Over the past two decades the main barrier to efficient electricity prices has been the unwillingness of regulatory bodies to consider any change that would have negative consequences for anyone. As a result, the

industry has engaged in all manner of costly, and often uneconomical, rationing schemes and passed the costs along to the entire customer base in the form of general rate increases. It is only now that emerging competition and deregulation is undercutting regulator's ability to attempt to protect every group, that efficient market-based prices are being widely considered.

3. Conclusion

The experience of the electric utility industry indicates that efficient pricing mechanisms would provide an effective solution to Internet access congestion. The Commission should do all it can now to hasten the creation of efficient Internet access prices. Delays will allow growth in those groups that have a stake in preserving the current inefficient, non-flexible prices. Once such groups become entrenched and achieve sufficient political support, the nation may undergo years of inefficient operation, excess costs, and inferior quality before efficient price structures can be created.

Finally, it should be noted that the efficient pricing principles generally apply to all facets of Internet congestion, not just those elements under the FCC's jurisdiction. For example, the congestion caused by local Internet providers could be relieved through efficient pricing. Similarly, the recent congestion problems experienced by America

Orline could be averted if providers priced their services according to efficient pricing principles.